

A Study to Find Out the Effect of Chair Aerobics Exercise on Fasting Blood Glucose in Type-2 Diabetes Mellitus Patients - An Interventional Study

Dr. Haseena Makrani¹, Dr. Pragna Gondaliya², Dr. Devki Mehta³,
Dr. Krisha Sheth⁴, Dr. Alfaiz Makrani⁵

¹Assistant Professor at Shama Institute of Medical Sciences, Ahmedabad, Gujarat.

²Associate Professor at Shree K.K. Sheth Physiotherapy College and Ph.D. Scholar, Faculty of Physiotherapy at Marwadi University, Rajkot, Gujarat, India

Corresponding Author: Dr. Haseena Makrani

DOI: <https://doi.org/10.52403/ijhsr.20231016>

ABSTRACT

Background and need of research: Walking is a component of diabetes mellitus (DM) care guidelines due to its favourable effects on Glycaemic control but many elderly Diabetics are unable to walk due to many reasons. Chair aerobics is a form of aerobic exercise Performed while sitting in a chair which includes rhythmic upper and lower body movements.

Methods: 30 patients were included. Chair aerobics as a low-intensity exercise training was given. Pre- and post-exercise outcome measurements in the form of FBS were recorded.

Result: The study showed a statistically significant difference in FBS (< 0.05.)

Conclusion and clinical implications: Chair aerobics as low-intensity exercise training demonstrated improvement in fasting blood glucose in type- 2 diabetes mellitus patients.

Keywords: Chair aerobics, diabetes mellitus, elderly

INTRODUCTION

Diabetes is a chronic, metabolic disease characterized by elevated levels of Blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin. In the past three decades, the prevalence of type 2 diabetes has risen dramatically in countries of all income levels. About 422 million people worldwide have diabetes, the majority living in low- and middle-income countries.¹

Walking is safe from the standpoint of both and is an excellent activity for Improving aerobic fitness. Walking is also simple, which allows most people to Participate.

Compliance with walking programs is usually high because walking Requires no special skills, facilities, or equipment and can be incorporated into most busy lifestyles.²

Chair aerobics is a form of aerobic exercise performed while sitting in a chair or with the help of a chair, which includes rhythmic upper and lower body movements. Chair aerobics is a low to medium-intensity exercise in which the spine is stabilized by a fixed base of support compared to that standing or dynamic exercises, which require a lot of stability. It also minimizes load-bearing on joints while some postural muscles are relaxed; it also reduces balance problems in those with poor mobility and makes a great form of exercise while sitting.³

Diabetes is associated with a greatly increased risk of cardiovascular mortality, which is the leading cause of death in adults with diabetes. While exercise training is the cornerstone of diabetes treatment, people with diabetes have well-described aerobic exercise impairments that may create an additional diabetes-specific barrier to adding exercise to their lifestyle.⁴

Chair aerobics provides a way for older adults to move without moving too much strain on their bodies. Chair exercises are perfect for those with limited mobility and balance issues.³

Walking makes your heart beat faster and breathe harder. During walking muscles use more glucose in the bloodstream. Over time this can lower blood sugar levels and it also makes the insulin body work better. According to the literature, aerobic exercises show a reduction in blood glucose level. So, the need arises whether chair aerobics is effective or not in comparison to walking.⁵

Aim of the study

- The aim of the study is to compare the effect of chair aerobic exercise and walking on blood glucose levels in type 2 diabetes mellitus patients.

Objectives of the study

- To find the effect of chair aerobic exercise on blood glucose level in type 2 diabetes mellitus patients.
- To find the effect of walking on blood glucose levels in type 2 diabetes mellitus patients.
- To compare the effect of chair aerobic exercise and walking on blood glucose levels in type 2 diabetes mellitus patients.

MATERIALS & METHODS

Methodology

- Study setting- Shree K. K. Sheth Physiotherapy College.
- Study population- type 2 diabetes mellitus patients.
- Source of data- in and around Rajkot.
- Sampling technique- purposive sampling

- Sample size- 30
- Study duration- 5 days/week for 4 weeks.
- The study was conducted on 30 subjects between the age group of 55-75 years. Subjects were taken from clinics in and around Rajkot based on random sampling. Before participation aims and objectives of the study were explained. All subjects were screened and detailed medical history was taken to exclude any serious illness. Informed consent was signed by the subjects for their voluntary participation. Then the following information was recorded for each patient: name, age, sex, address, height, weight, BMI, and Fasting blood glucose. Subjects were requested to continue their normal activities and avoid any other form of exercise for the duration of the study.

Inclusion criteria

- Age group: 55-75 years
- Gender: both male and female
- Subjects who have T2DM for the last 5 years

Exclusion criteria

- Any neurological disorders
- Any cardiovascular-pulmonary disease
- Any recent injury or surgery of the upper limb or lower limb.
- Any Psychological disorder.
- Uncontrolled diabetes
- Patients taking insulin injections

Materials

- Chair
- Glucometer
- Stopwatch
- Pen
- Paper
- Assessment form
- Consent form
- Plinth

Procedure

30 Patients with type-2 diabetes mellitus were randomly selected and the study was explained to them then patients were purposively assigned into two groups.

1. **Group-A:** 15 patients had received chair aerobics exercise.
2. **Group-B:** 15 patients had received walking in form of exercise.

Patients in both groups had received exercise training 5 days a week for 4 weeks. In each group, the patients were given 10 minutes of a general warm-up including stretching and mild intensity exercise followed by 20 minutes of exercise according to protocol and the last 10 minutes of cool down.

Exercise protocol

□ Group-A (Chair aerobics exercise)

Chair aerobic exercises had given as below: (8 repetitions of 2 sets)

1. Alternate heel raises with bilateral biceps curl
2. V- step with bilateral hammer curls
3. Lateral step touch with bilateral biceps curl
4. Toe touch with alternate elbow extension
5. Knee lift with raised hand claps
6. Knee extension with front hand raise
7. Diagonal leg raises with hand swing.

□ Group-B (Walking for 30 minutes)



STATISTICAL ANALYSIS

Study design: Interventional study.

Test: The collected data were analysed by Wilcoxon signed rank test to compare the result within the group and Mann Whitney U test to compare the result between groups

with a 0.05 level of significance with a 95% of the confidence interval.

RESULT

Table 1 shows comparison of pre and post FBS in Group A

Group A	MEAN	Z value	P value	Result
Pre FBS	181.86	3.411	< 0.05	Significant
Post FBS	162.86			

Graph 1 shows comparison of Pre and post FBS in group A

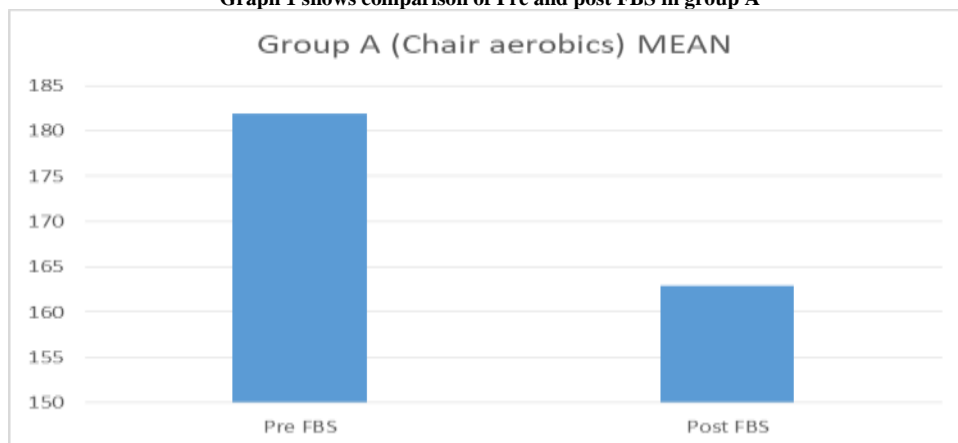


Table 2 shows comparison of pre and post FBS in Group B

Group B	MEAN	Z value	P value	Result
Pre FBS	149.00	1.558	> 0.05	Not - Significant
Post FBS	162.86			

Graph 2 shows comparison of Pre and post FBS in group B

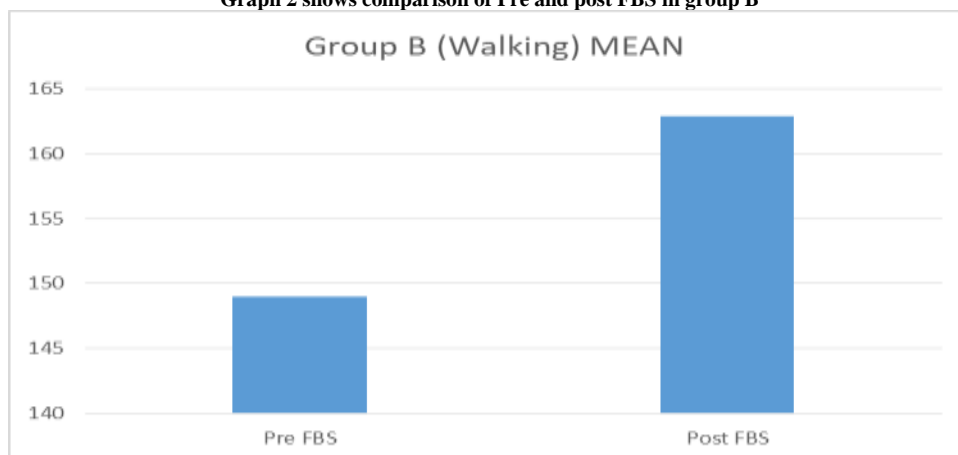
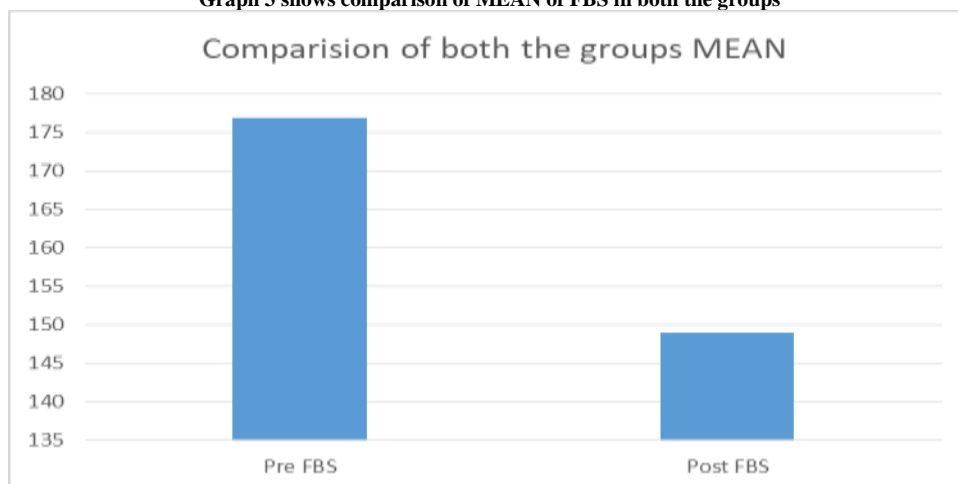


Table 3 shows comparison of MEAN of FBS in both the groups

Between both groups	MEAN	Z value	P value	Result
Pre FBS	176.80	3.408	> 0.05	Significant
Post FBS	149.00			

Graph 3 shows comparison of MEAN of FBS in both the groups



DISCUSSION

The current study compared the effect of chair aerobics exercise and walking on Fasting blood glucose in T2DM patients. The main finding was that both chair aerobics exercise and walking lowered Fasting blood glucose levels in T2DM patients. Chair aerobic exercise and walking belong to low to moderate-intensity of aerobic exercise. However, the relative intensity depends on exercise speed and subjects' aerobic capacity. Most of the subjects in this study have no regular exercise training habits or only carry out a small amount of low-intensity exercise in daily life. In addition to the long-term disease history, the exercise capacity or physical fitness level in these patients is quite low.

There was a significant difference in blood glucose levels in pre and post-intervention in both chair aerobic exercise and walking groups but there was no significant difference between both groups, so both chair aerobic exercise and walking showed a similar effect on fasting blood glucose levels indicating that both chair aerobics exercise and walking are equally effective in reducing blood glucose level.

The reduction in blood glucose level may be related to the following reasons: Aerobic exercise is more effective in increasing GLUT4 protein content of skeletal muscle, promoting glucose transport and utilization, and contributing to a greater depletion of muscle glycogen, thereby increasing the uptake of glucose in muscle tissue to provide energy supply.⁶

Skeletal muscle in the human body is not uniform; the lower limb mostly consists of type 1 muscle fibers, whereas the upper limb primarily consists of type 2 muscle fibers. Fast twitch muscle fibers are type 2 and slow twitch muscle fibers are type 1. In contrast to type 2 muscle fibers, which can handle both high and low glycolytic and oxidative fractions, type 1 muscle fibers can handle both.⁷

According to David B Olsen et al Glucose clearance is higher in the arm than leg muscle in type 2 diabetes. Additionally, while walking over long distances, the leg muscles must thrive on several glycogen-protective devices. In the chair, aerobic exercise utilization of small arm muscles is more while in walking utilization of large leg muscles is more.⁷

Based on these facts, Aerobic exercise is prone to have a better hypoglycaemic effect, which is consistent with the findings of Gillen et al.⁸

Nevertheless, Kjaer et al⁹ Presented that a single bout of maximal exercise resulted in 1 hour of post-exercise hyperglycemia and this effect may be owing to exaggerated Counter-regulatory hormonal responses following extreme intensity exercise. It is really hard to conclude

CONCLUSION

Chair aerobics as low-intensity exercise training demonstrated improvement in fasting blood glucose in type- 2 diabetes mellitus patients so it can be used as a replacement for dynamic exercises.

Elderly subjects find difficulty in walking due to many reasons like knee pain, foot pain, leg pain, and other locomotor impairments so in that type of population chair aerobics can be used as a form of low-intensity aerobic exercise to reduce blood glucose levels.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: Author would like to thank patients for taking part in the study.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

Abbreviations

T2DM- type2 diabetes mellitus

FBS- fasting blood glucose

HIE- high-intensity exercise

REFERENCES

1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 2010 Jan;33 Suppl 1(Suppl 1): S62-9. doi: 10.2337/dc10-S062. Erratum in: *Diabetes Care*. 2010 Apr;33(4): e57. PMID: 20042775; PMCID: PMC2797383.
2. Overview | Type 2 diabetes in adults: management | Guidance | NICE [Internet]. [Cited 2023 Mar 8].
3. Thapa, Sh & Pattanshetty, Renu. (2016). Effect of Chair aerobics as low intensity exercise training on heart rate, blood pressure and six-minute walk distance in post coronary artery bypass graft surgery patients through phase I cardiac rehabilitation. *Nepalese Heart Journal*. 13. 19. 10.3126/njh.v13i1.14540.
4. Struijs JN, Baan CA, Schellevis FG, Westert GP, van den Bos GA. Comorbidity in patients with diabetes mellitus: impact on medical health care utilization. *BMC Health Serv Res*. 2006 Dec 1;6(1):84.
5. Roe J, Aspinall P. The restorative benefits of walking in urban and rural settings in adults with good and poor mental health. *Health Place*. 2011 Jan 1;17(1):103–13.
6. Way KL, Hackett DA, Baker MK, Johnson NA. The Effect of Regular Exercise on Insulin Sensitivity in Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis. *Diabetes Metab J*. 2016 Aug 2;40(4):253–71.
7. Olsen DB, Sacchetti M, Dela F, Ploug T, Saltin B. Glucose clearance is higher in arm than leg muscle in type 2 diabetes. *J Physiol*. 2005 Jun 1;565(Pt 2):555-62. doi: 10.1113/jphysiol.2004.081356. Epub 2005 Mar 17. PMID: 15774531; PMCID: PMC1464541.
8. Gillen JB, Little JP, Punthakee Z, Tarnopolsky MA, Riddell MC, Gibala MJ. Acute high-intensity interval exercise reduces the postprandial glucose response and prevalence of hyperglycaemia in patients with type 2 diabetes. *Diabetes Obes Metab*. 2012 Jun;14(6):575-7. doi: 10.1111/j.1463-1326.2012.01564.x. Epub 2012 Feb 20. PMID: 22268455.
9. Kjaer M, Hollenbeck CB, Frey-Hewitt B, Galbo H, Haskell W, Reaven GM. Glucoregulation and hormonal responses to maximal exercise in non-insulin-dependent diabetes. *J Appl Physiol* (1985). 1990 May;68(5):2067-74. doi: 10.1152/jappl.1990.68.5.2067. PMID: 2193907.

How to cite this article: Haseena Makrani, Pragna Gondaliya, Devki Mehta, Krisha Sheth, Alfaiz Makrani. A study to find out the effect of chair aerobics exercise on fasting blood glucose in type-2 diabetes mellitus patients - an interventional study. *Int J Health Sci Res*. 2023; 13(10):115-120. DOI: [10.52403/ijhsr.20231016](https://doi.org/10.52403/ijhsr.20231016)
